Periscope.

a.—ANATOMY OF THE NERVOUS SYSTEM.

EXPERIMENTAL RESEARCHES ON THE CONNECTION OF THE VISUAL AREA AND THE SUBCORTICAL CENTRES AND OPTIC NERVE.—V. Monakow has been investigating the course of the visual tract by the method of Gudden, extirpating from new-born animals various parts of this tract and observing the subsequent atrophy. His results are as follows. The first series of experiments was upon rabbits :

1. If one eyeball be extirpated there follows an atrophy of the optic nerve, and of its continuation through the chiasm, and in the optic tract of the opposite side, the decussation being complete. This atrophy can be traced into the gray masses in which the tract ends, viz., the corp. genic. ext., the pulvinar, and the ant. corp. quadrigem. These gray masses are not atrophied in their entire mass, but certain layers only are affected. In the corp. genic. ext., the white capsule which surrounds the ganglion on its lateral, ventral, and dorsal surface is reduced to a very thin layer ; and the gelatinous substance in the lateral part of the dorsal nucleus is atrophied. The number and appearance of the ganglion cells are not changed. In the pulvinar the similar portions, viz., the capsular fibres and the basis substance, and not the ganglion cells, are the parts which atrophy. In the corp. quadrigem. ant. the atrophy is limited to the first two layers, viz., the surface gray and superficial white layer. In the surface gray the upper zone is reduced by the disappearance of the zonal and ependymal fibres and of the small cells of this layer—the cells which remain however presenting a normal appearance ; the lower zone is reduced by the shrivelling of the polygonal cells which it contains, many of which had lost their processes. In the superficial white layer the axis-cylinders of the fibres had almost wholly disappeared, and this atrophy could be followed into the brachium of the corp. quad. ant. The other layers of the corp. quad. ant. were not affected.

2. If the cortex of the occipital convolutions of one side be extirpated, there follows an atrophy of the tract (known as Gratio-

let's radiation) which joins these convolutions with the corp. genic. ext., the pulvinar, and the ant. corp. quadrigem. This atrophy can be followed through the posterior portion of the posterior half of the internal capsule and into these ganglia. In the corp. genic. ext. the entire ganglionic mass is much reduced in size, the ganglion cells being the part affected. The gelatinous substance is somewhat atrophied and the white capsule is thinner than normal, but these parts are not as much changed as in the first set of cases. In the pulvinar both ganglion cells and basis substance are reduced in number and size, and the zonal fibres are less fully developed than on the sound side. In the corp. quadrigem. ant. the first two layers are not affected to any extent, but a marked atrophy occurs in the deep white layer, and in the brachium corp. quad. ant. The deep gray layer did not appear to be affected, nor were the other layers involved. From these experiments v. Monakow concludes that in the rabbit the visual tract leads from the retina of one side to the occipital convolutions of the opposite side—a tract which is not direct, but is broken by the interposition of the basal ganglia named. The fact that in both experiments the gray network of the gelatinous and basis substance of the ganglia were affected, while in each, separate parts of the ganglia were atrophied, indicates that the two tracts are not independent. The optic fibres end in the gray network of the ganglia, whence impulses reach the cells of the ganglia, which in turn are in direct connection with the cortical cells.

3. If the posterior portion of the internal capsule, through which this visual tract passes, be divided, there follows an atrophy both of the Gratiolet radiation and of the cortex. The cortical atrophy was not, however, uniform, but was limited to the third and fifth layers of the cortex, viz., the layer of large pyramidal cells, and the layer of multipolar ganglion cells. The ependymal layer, the layer of small pyramidal cells, and the layer of spindle cells were not involved in the atrophy. Hence v. Monakow concludes that it is with the third and fifth layers of the cortex that the basal ganglia are directly connected, and that it is in these that visual impulses are perceived.

A second series of experiments has been performed upon kittens. This series shows that in these animals the optic nerves decussate partially, not wholly as in rabbits. The optic tracts end in the white capsule and in the gelatinous substance of the corp. genic. ext., in the basis substance of the pulvinar, and in the upper two layers of the corp. quadrigem. ant. The occipital cortex is in connection wirh the ganglion cells of the corp. genic. ext., the pulvinar, and the deep gray of the corp. quadrigem. ant. Extirpation of various parts of the occipital cortex produces various changes in the ganglia. So that the conclusion is warranted, that the median portion of the visual area of the cortex is connected with the lateral portion of the basal ganglia, and the lateral portion of the cortical area with the median portion of the ganglia. Hence the fibres from these two portions cross one an-

other in the posterior part of the internal capsule. But inasmuch as different parts of these basal ganglia atrophy, when one or the other optic nerve is divided, it follows that the median half of the occipital cortex is connected with the eye of the opposite side, and the lateral portion of the cortex with the eye of the same side. This is the same conclusion which was reached by Munk from his physiological experiments. The corp. quadrigem. ant. appears to have less connection with the optic tract in cats than in rabbits, inasmuch as it is less involved in the secondary atrophy. This is also the case in man.

That these conclusions are true of man as well as of lower animals, v. Monakow is able to prove by means of the examination of pathological cases. In a case of porencephalie both occipital lobes were destroyed in fœtal life by embolism of the post.-central arteries. The infant lived two days. After death large defects of substance were found in both hemispheres, and, as a result, a secondary atrophy occurred in the subcortical centres. The appearance was the same as in the experiments by extirpation of the cortex in cats. Associated with the defective development of the occipital lobes there was a defective development of the corp. genic. ext., the pulvinar, and, to a less extent, of the corp. quadrig. ant. The optic tracts and nerves were also atrophied to a considerable degree. The fact that in both experimental cases, and in the case of porencephalie, the corp. genic. int., Luys' body, and the corp. quadrigem. post. were not affected, is proof that these ganglia have nothing to do with the visual tract.

In a case of thrombosis and softening of both occipital lobes in patient seventy years old, who lived four years after the onset of the symptoms, a secondary degeneration was found from the atrophied right occipital lobe, through the radiation of Gratiolet into the corp. genic. ext., the pulvinar, and the corp. quadrigem. ant., and thence along the right optic tract to the chiasm and into both optic nerves. The lesion in the left occipital lobe was of more recent date, and had not produced any atrophy. This case supports in all respects the conclusions reached from the examination of the porencephalic brain, and of the animals subjected to Gudden's method of experimentation. It is, therefore, of great value.

The results reached may be summed up as follows: Each eye is connected with both optic tracts, and thus with both corp. genic. ext., with both pulvinars, and to a slight extent with both corp. quadrigem. ant., the connection with the ganglia of the opposite side being more extensive than with those of the same side. The optic tracts end in the gray network and gelatinous substance of these subcortical centres. The ganglion cells of these subcortical centres, into which impulses pass directly from the gray network and gelatinous substance, are in direct connection with the cortex of the occipital lobes; the median portion of the subcortical centres being joined to the lateral part of the cortical visual area, and their lateral portion being joined to the median part of the cortical area. Thus the median half of each

occipital region receives impulses from the nasal half of the eye of the opposite side, and the lateral half of each occipital region receives impulses from the temporal half of the eye of the same side.

This conclusion is in perfect accord with that of Wernicke and Wilbrand, reached by a study of pathological cases. It confutes finally the scheme of Charcot, and demonstrates that a lesion of one occipital lobe must produce bilateral hemianopsia.—*Arch. für Psychiatrie*, xiv., 698–750 ; and xvi., 151–200.

THE RELATION OF THE GRAY MASSES OF THE NERVOUS SYSTEM TO THE PERIPHERAL ORGANS.—Prof. Alex. Hill has subjected the doctrines of localization to the test afforded by a study of comparative anatomy. In the light of the theory of localization of function, the different regions of the brain are as separable one from another as different organs of the body. This specialization of function must be associated with specialization of structure. If the different regions of the brain have different kinds of work to do, the extent to which they are developed will vary as to the amount of work apportioned to each. One brain receives no sensations of sight, another none of hearing, another none of smell.

If the regions which physiologists regard as the centres of these functions be equally developed, the theory falls. If an obvious distinction in development obtain, it may stand. Any attempt at exact delimitation of areas is impossible, until a method has been invented by which the percentage of superficies of different regions can be obtained in a large number of brains. Accepting this principle, Hill applies it to the ungulate and carnivorous types. Herbivora depend for safety almost entirely upon the eye and upon rapidly repeated, but simple, movements of the limbs. Carnivora depend upon the sense of smell and upon complex co-ordinated movements of the whole body. With great muscularity is associated a large sigmoid gyrus. Animals in whose daily life sensations of smell play a large part present long brains with considerable development of the gyrus hippocampi and of a part of the temporo-sphenoidal lobes. The development of the inner part of the occipital lobes varies with the sense of sight.—*British Medical Journal*, March 14 and 21, 1885.

Prof. Hill seems to be unaware that this line of research has been extensively pursued by Spitzka in this country, and by several German anatomists, the authorities whom he mentions being chiefly English. The subject is one, however, which admits of further research, and it is to be hoped that with the large collection of brains in the Hunterian Museum at his command, the Hunterian professor will obtain and publish more detailed results.

THE MIDDLE PEDUNCLE OF THE CEREBELLUM.—Bechterew finds two systems of fibres passing from the hemisphere of the